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Observations from the field:

ACTIVE ACOUSTIC SYSTEMS, ARCHITECTURE, PERFORMERS, AND AUDIENCE

Acoustics '17, ASA EAA, Boston, Wednesday 28 June 2017, 14:00

Introduction

- Active acoustic systems' potential advantages
  - Greater parametric control than architectural systems
  - Less physical and visual impact on architecture
  - adjustments made and compared almost instantly
- With almost limitless combinations possible, how do we quantify and qualify these settings?
- Observations and return from experience is presented
- Scope: Music

Active Acoustic System Project Development

- Concept Development
  - Engage and Inspire Client
  - Develop Budget
- System Design
  - Scope and goals
  - Architectural integration
- System Installation
  - Pre-installation verification
  - Installation by integrator
  - Post-installation verification
- System Tuning
  - Offsite calibration
  - Onsite calibration
  - Voicing (engage and inspire client)
- Education
  - Voicing
  - Return adjustments

Tallinn

Fosnavag

Bergen

Rosendal

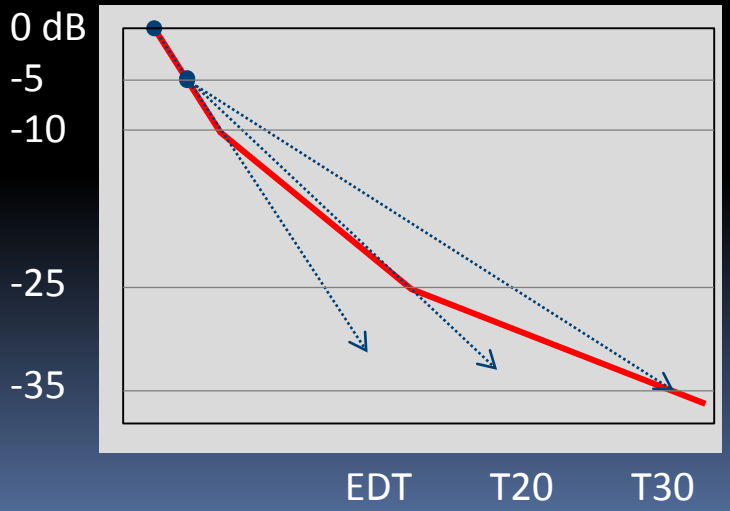
Rosendal

International
Chamber Music
Festival venue

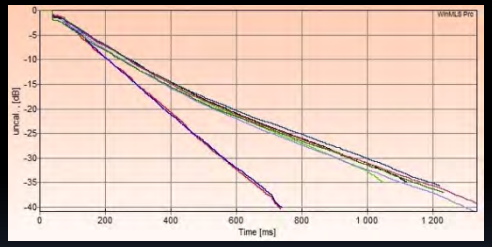
Leif Ove Andsnes

Non-linear decay

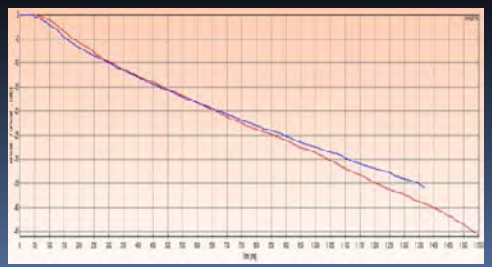
- Double Slope(s) in Schroeder diagram
  - Curvature C% = T30/T20 - 1
  - Slope ratio EDT/T30
- More early energy -> Less Reverberance (EDT)



Tallinn

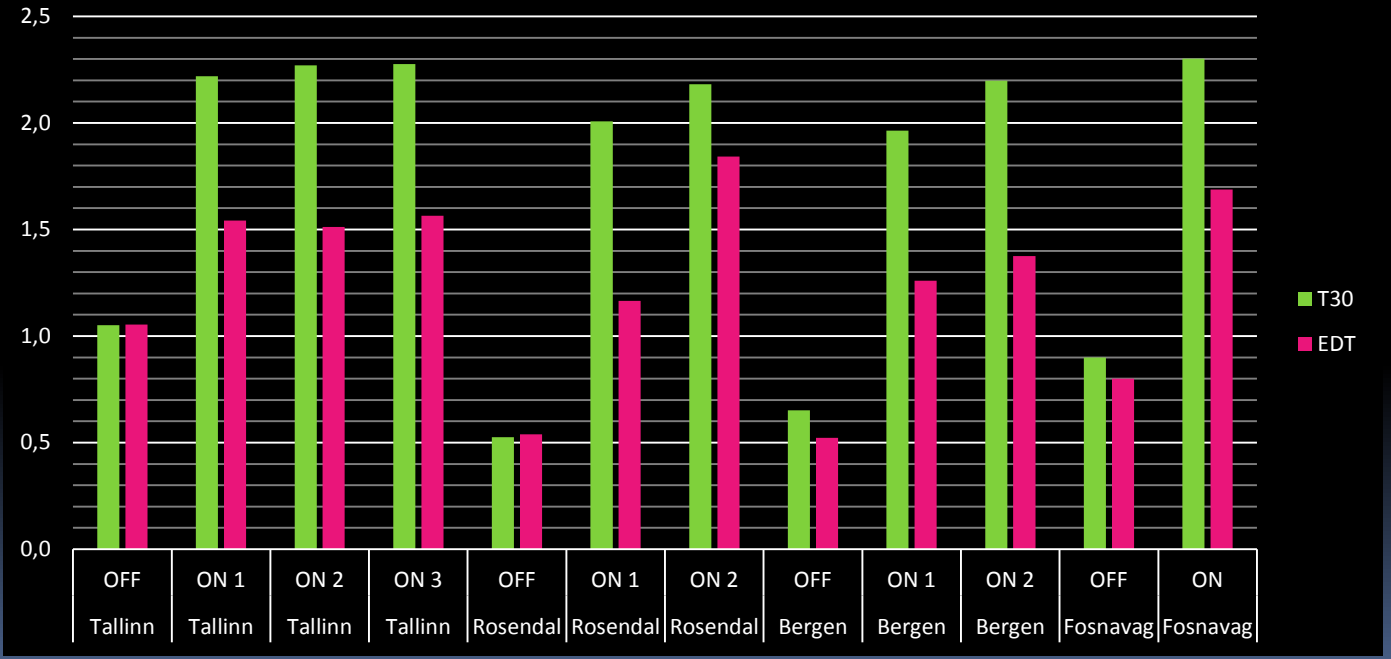


Fosnavag



Reverberance (EDT) and RT (T30)

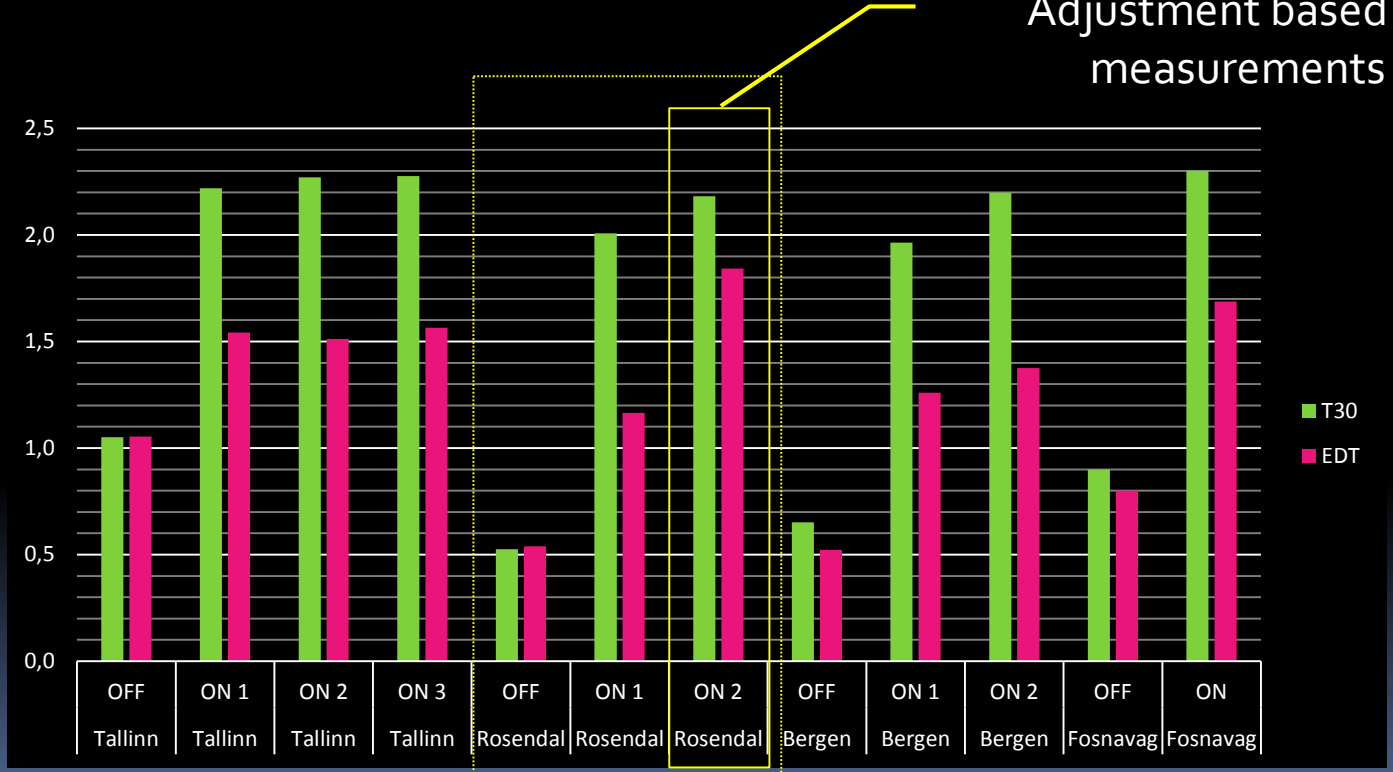
EDT/T30 average = 0.7 (ON)



Reverberance (EDT) and RT (T30)

EDT/T30 average = 0.7 (ON)

Adjustment based on measurements



The 3 balance parameters

Very important to concert listeners

1. Early-Late Balance
2. Front-Back Balance
3. Median-Lateral Balance

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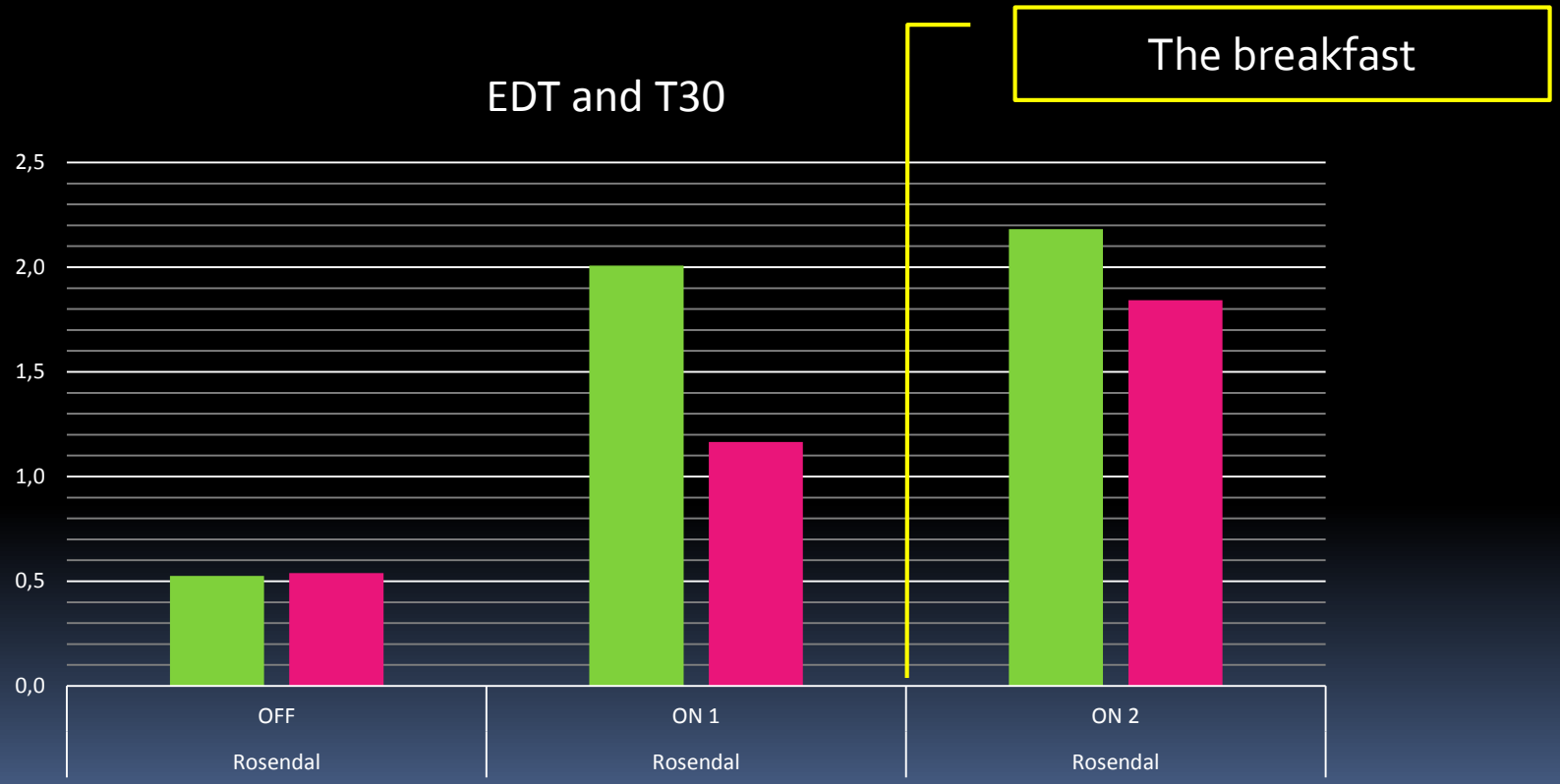
«Involvement and Intimacy»

vs

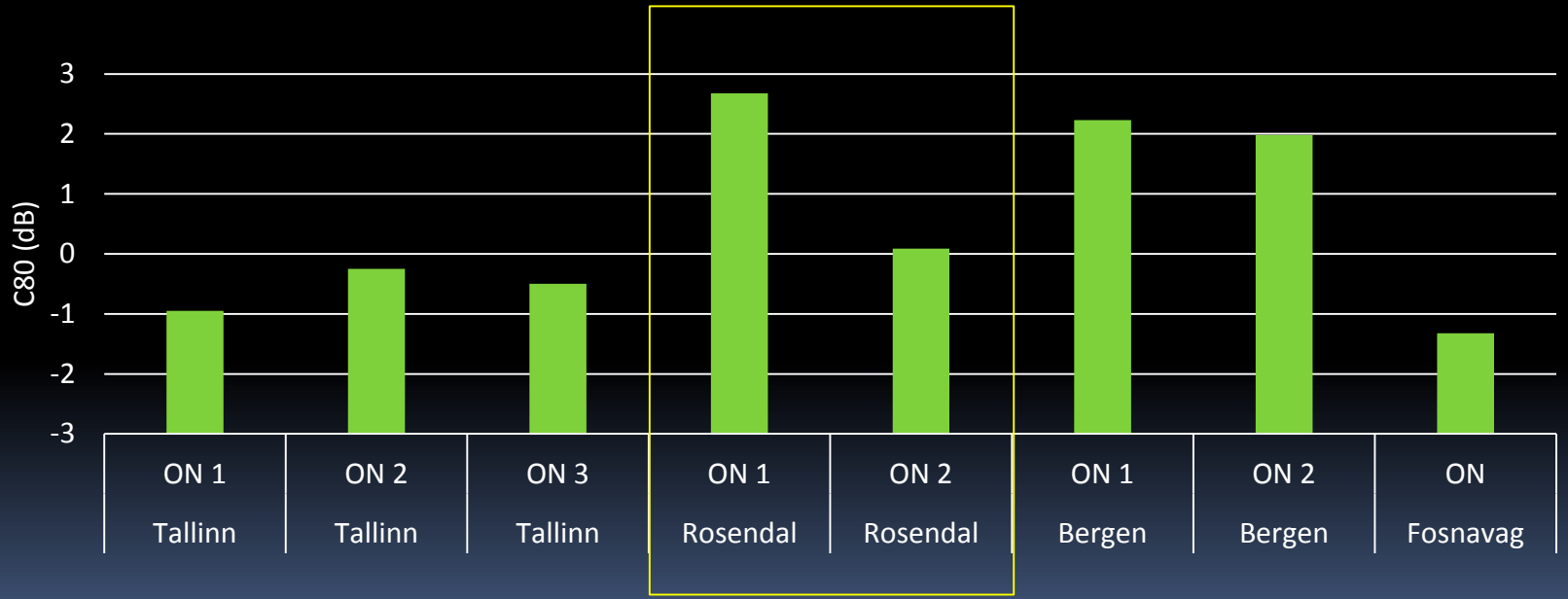
«Distant observation of music»

The Rosendal case



Early-Late Balance

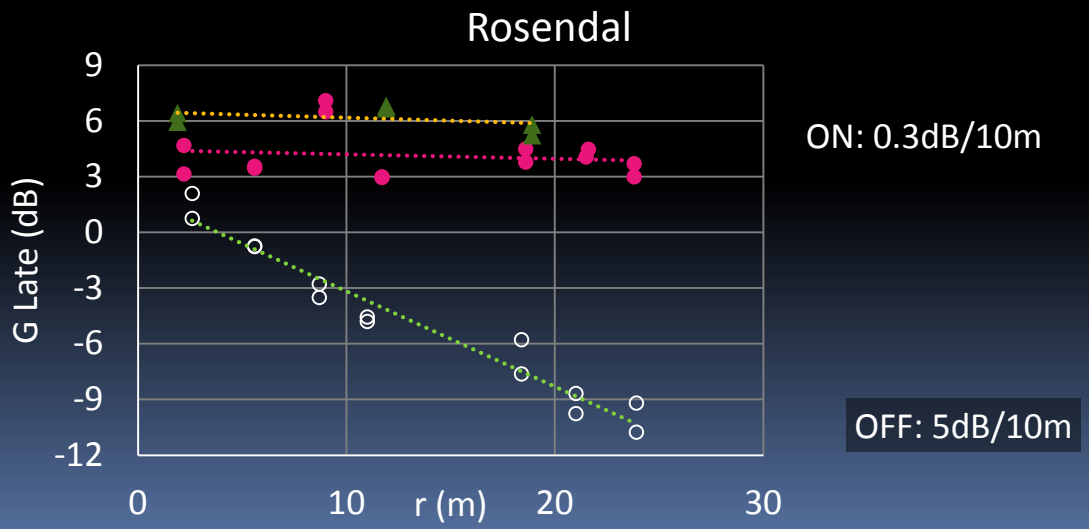
- Chamber music target C80 = 0dB



Front-Back Balance

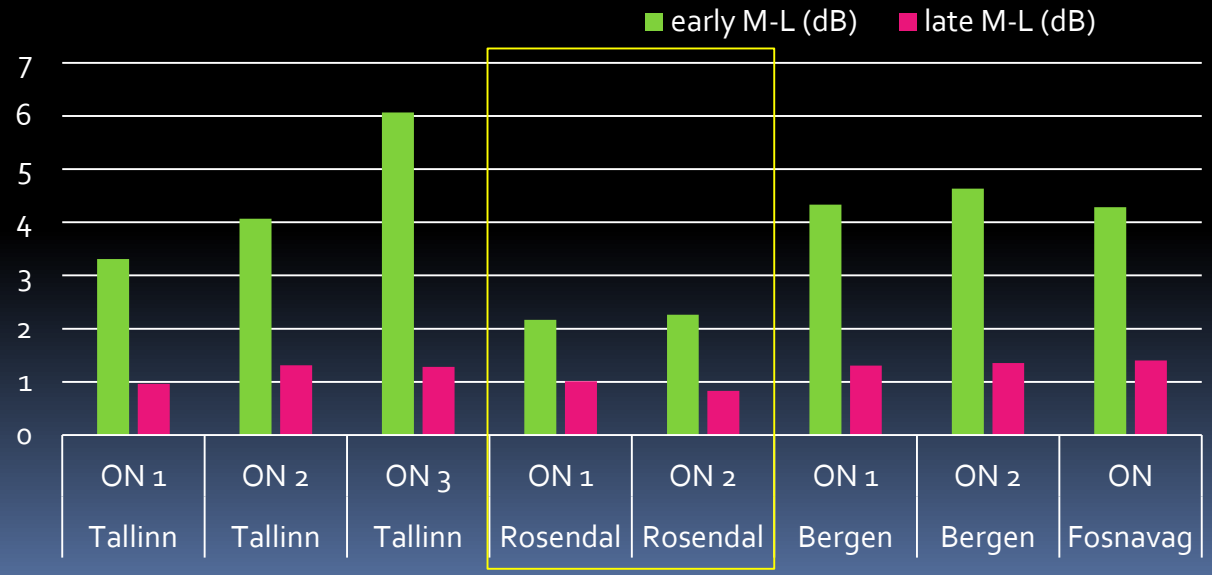
G_late attenuation w distance < 1dB per 10 meter (Barron Revised Theory)

- For Involvement and Intimacy
- Avoid frontal sound and distant observation of events on stage
- Avoid weak sound in back of hall



Median - Lateral Balance (Narrow <–> Wide sound image)

- M - L = 10lg(1+IACC) – 10lg(1-IACC)
  - Loudspeaker balance: ceiling – side walls
  - < 3dB to avoid narrow sound image

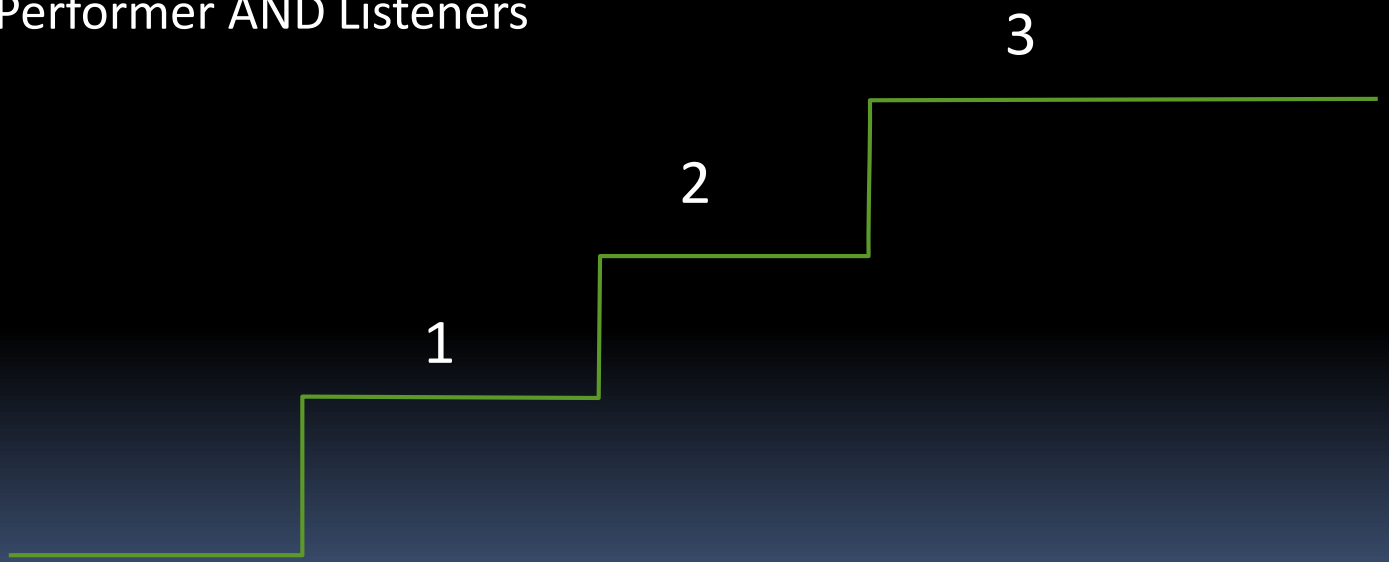


Room’s basic acoustic

- Excessive absorption demand more resources from AAS
- Sound reflection control – don’t «break the illusion» of virtual room
- HVAC designed for low noise even in loudest AAS mode

When aiming for excellent acoustics, who to please?

1. Performers - conductor, soloist, orchestra
2. Listeners - from first to last row
3. Performer AND Listeners



Assessment during Voicing / Tuning of the system

- Ears – who’s ears ?
- Who’s ears represent the orchestra and the listeners?
- Support by measurements

Working with Specifications and Pre-defined target values

Parallels in development?

- Architectural Acoustics
  - Reverberation Time
  - Early sound -> too much
  - C80 Balance
  - Height-Width-Ratio
  - EDT
  - LF, IACC
  - ….
- AAS
  - Reverberation Time
  - Clarity
  - Early sound
  - …..
  - …..

Trend: More -> Too much -> Balance

Data (Constellation ON-OFF)

Venue	AAS	T30	EDT	C%	EDT/T30	C80	BQI	iaccE3	iaccL3	early M-L (dB)	late M-L (dB)	late dB/10m
Tallinn	OFF	1,1	1,1	0 %	1,0	2	0,57	0,43	0,17	4	1	
Tallinn	ON 1	2,2	1,5	16 %	0,7	-1	0,64	0,36	0,11	3	1	
Tallinn	ON 2	2,3	1,5	13 %	0,7	0	0,56	0,44	0,15	4	1	
Tallinn	ON 3	2,3	1,6	11 %	0,7	-1	0,40	0,60	0,15	6	1	
Rosendal	OFF	0,5	0,5	5 %	1,0	8	0,71	0,30	0,13	3	1	5
Rosendal	ON 1	2,0	1,2	2 %	0,6	3	0,76	0,24	0,12	2	1	0
Rosendal	ON 2	2,2	1,8	1 %	0,8	0	0,75	0,26	0,10	2	1	0
Bergen	OFF	0,7	0,5	0 %	0,8	10	0,44	0,56	0,20	5	2	5
Bergen	ON 1	2,0	1,3	-7 %	0,6	2	0,54	0,46	0,15	4	1	3
Bergen	ON 2	2,2	1,4	3 %	0,6	2	0,51	0,49	0,15	5	1	1
Fosnavag	OFF	0,9	0,8	-	0,9							
Fosnavag	ON	2,3	1,7	3 %	0,7	-1	0,54	0,46	0,16	4	1	

Thank you

More info?

The www center for search, research and open sources in acoustics

www.akutek.info

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